No. 70, July 1977

THE KAESER SITE: A STRATIFIED SHELL MIDDEN IN THE BRONX, NEW YORK

Nan A Rothschild
Lucianne Lavin

Metropolitan Chapte
New York Universit

The Kaeser site (FLG 1-1) is a shell midden (composed predominantly of hard-shell cla located in Pelham Bay Park, Bronx County, New York, on the north shore of Eastchester Bay. The site lies south of City Island Road, and east of Pelham Bridge, close to the drainage of th Hutchinson River into the Bay (Fig. 1). It appears to have been sporadically occupied during Late Archaic, Early (or early Middle) and Late Woodland, and Historic periods.

The site was excavated over two seasons (24 May-6 June, 1973 and 14-29 June. 1975). initially as a salvage operation and later to test an hypothesis formulated during analysis of t first season's excavated material. This hypothesis relates to the way shell middens are deposited.

In a small-scale. seasonally occupied site, it is hypothesized that people using the site will occupy one area of the site for a period of time. returning there each year. As the shell debris gets deeper. seasonal migrants will move to occupy a new (perhaps adjacent) part of th site. Thus the accumulation of midden may occur not in layers but in heaps (cf. Salwen and Vetter 1974). more like the "basketload" phenomenon described in mound-building (Griffin. Flankers and Titterington 1970; Neumann and Fowler 1952). The test implication of this hypo sis is that one will find culturally and temporally distinct, spatially separate areas within the midden if the hypothesis is valid. If there is an even spread of artifacts from a given culture period. the hypothesis will be rejected.

Traditionally it has been virtually impossible to discern stratigraphy within shell midd Our argument here is that on such sites, "stratigraphy" may often be visible in the spatial separation of chronologically distinct materials rather than in the superposition of such mat The latter may occur on the peripheries of two spatially and chronologically discrete occu where artifacts of the later group will physically overlap those of the earlier one. Superposi may also occur when midden depositions are very thin.

As we shall demonstrate, the results of the Kaeser excavations show that not only can w see spatially separate areas which differ from each other in chronological placement but we also correlate certain activities with these areas suggesting that the activities be seen as tim dependent.

Condition of the Site

The 1973 excavation was undertaken when shell debris was observed in a trench dug b Con Ed for a pipeline adjacent to the pedestrian path along City Island Road. Shell midden wa visible all along the length of this trench, suggesting that the area covered by the site had on been quite extensive (perhaps 1-2 acres). Much of the area had been disturbed even before t Con Ed trench; the remains of shell midden overlay an old black-top road. Further. the te tory directly north of the area that we excavated had a thick soil deposited on it; it also appe to have been bulldozed, with a line of boulders representing the line where the dozing had st (Figure 2).

The more limited 1975 excavation was undertaken to test the hypothesis on midden dep sition.

Prior to excavation. auger testing determined the extent of the midden in the seemingl undisturbed area of the site. The site presently extends at least 150 ft. along the shore. at approximate elevation of 10 ft. above sea level. An eroding embankment delineates the sout

---

Cover illustration: This cover is a repeat of that which appeared in NYSAA Bulletin 68. No ber 1976. where specimens d. e. in line 3 and b in line 4 faded out in printing. The printer. Braun-Brumfield, Inc.. has kindly consented to re-run the cover without cost. The point typ description will be found on page 36.

offsite
GN
795
.R68
1977g

AVERY ARCHITECTURAL AND FINE ARTS LIBRARY
GIFT OF SEYMOUR B. DURST OLD YORK LIBRARY

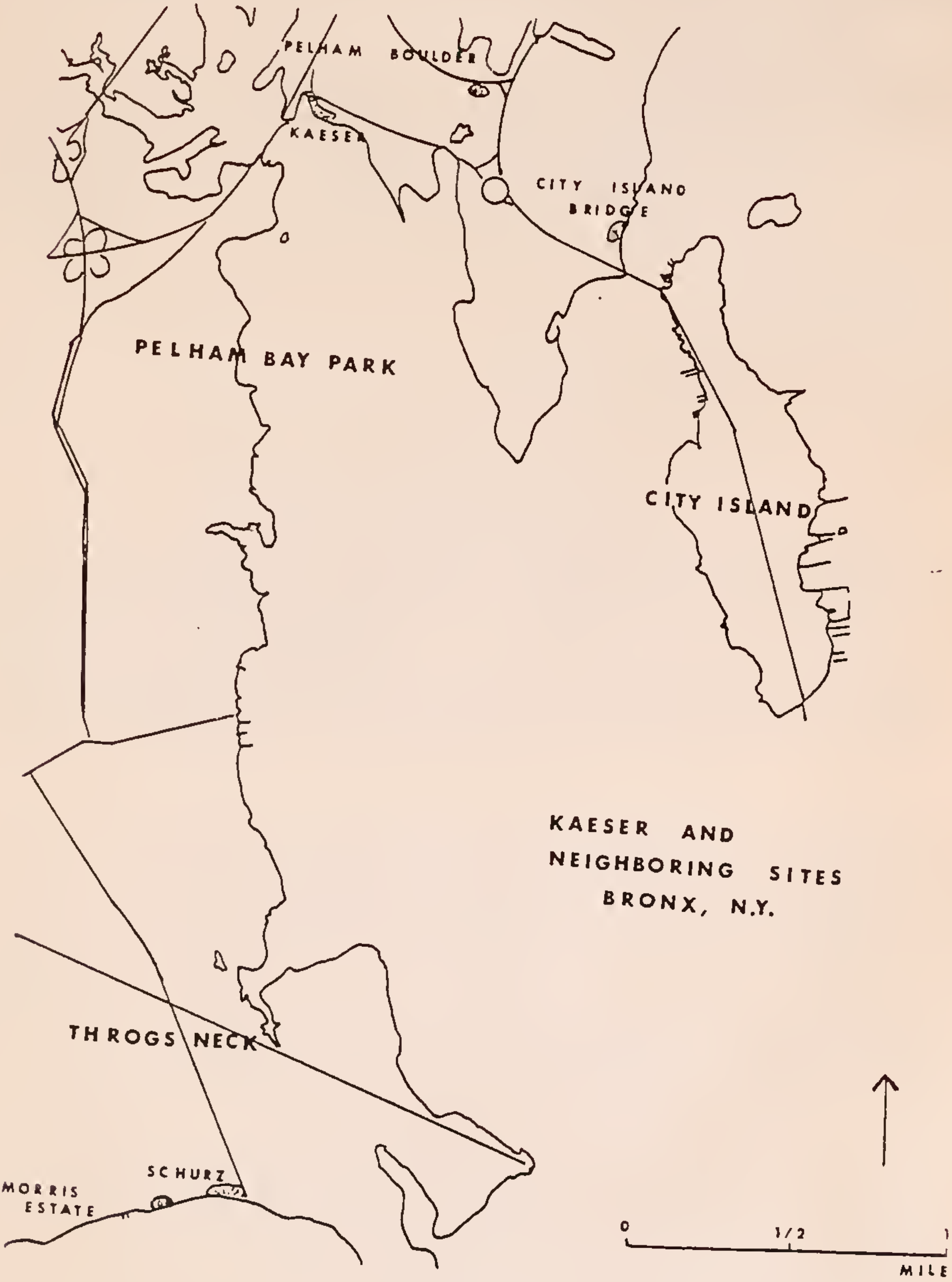
PELHAM BOULDER
KAESER
CITY ISLAND BRIDGE
PELHAM BAY PARK
CITY ISLAND
KAESER AND NEIGHBORING SITES BRONX, N.Y.
THROGS NECK
SCHURZ
MORRIS ESTATE
0
1/2
1
MILE

FIGURE 1.

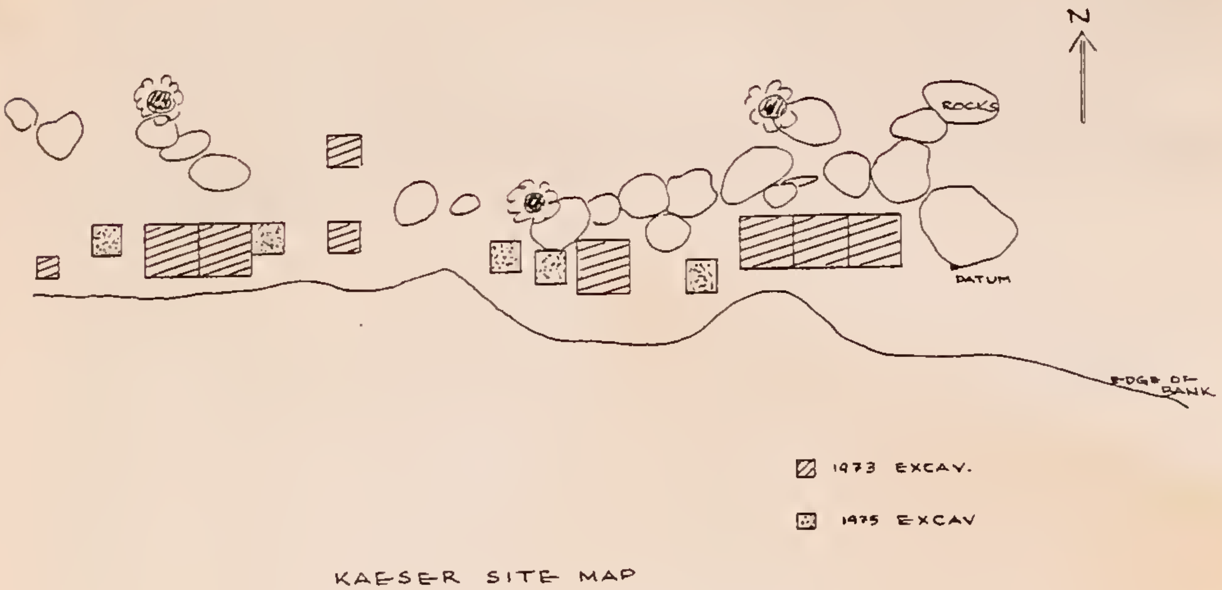

FIGURE 2. Kaeser Site map.

edge of the site, while the boulders noted above mark the northern edge of the undisturbed po tion. Edward Kaeser, a member of the Metropolitan Chapter who first discovered the site, co firmed that it was originally larger, but erosion and local use of the park (fishermen and squatters) had destroyed some parts of it.

An east-west base line was established, and all squares were located in reference to th line. In 1973 ten squares were excavated, 6 of them were 5-ft. squares, and 4 were smaller 2 and 3-ft. squares. All material was screened through a 1/4 in. mesh screen. In 1975, 6 mor 3-foot test squares were dug.

I. Stratigraphy

3 strata were distinguished throughout the site. A top layer of dark brown humus contai a variety of historic materials, ranging from contemporary (beer cans, etc.), to one possibly 17th century red clay pipe-stem fragment (Lockhart, personal communication). The majority of the material was from the 19th and 20th centuries (stoneware, coins and glassware); the quantity present is consistent with sporadic use of the park. The humus layer also contained approximately 8% of the aboriginal material recovered at Kaeser (Figure 3). The mean pH o this level was 5.75.

The second layer was composed of shell midden. It contained some post-contact materi (3% of that found at the site) and a variety of prehistoric artifacts spanning a number of cultur periods. Pottery, lithic material, bone and worked shell were recovered, with the majority o artifacts being lithic.

The midden ranged from a thickness of 6 in. to almost nothing. Underlying the midden w a layer of yellow-orange sandy earth which contained almost half of the prehistoric artifacts r covered. The top 2 in. of this layer were mottled, and contained clam fragments, which sugge that this represents the base of the midden. The orange layer was excavated to a maximum d of 12 in. below artifactual material but it was consistently sterile below 3 in. depth. In some squares a large number of cobbles and pebbles in the yellow-orange layer suggests the possib of an earlier beach layer.

Only one feature was found, a roughly circular arrangement of stones found in the yello orange layer of 5WON. Dark brown mottled earth was mixed with the orange between the ston and a circular concentration of shell appeared above the feature. There was no cultural mat l. charcoal or fire-cracked rock within the circle. However, the largest collection of pottery a the site came from the same square (from both the orange and shell layers), and 3 narrow-stemmed (Wading River) points were found adjacent to the feature. The interpretation of thi feature is a matter of conjecture. We can more readily say what it is not (i.e., it is probabl not a hearth) than what it is.

II. Pottery

53 sherds were recovered from the Kaeser site. 49 (92%) of them are undecorated an (8%) are decorated. 39 (74%) of the sherds (including the 4 decorated sherds) were excavate from the shell layer, while the remaining 14 (26%) sherds were located in the first 2 in. of orange sand (Fig. 3). Both the undecorated and decorated sherds have been classified into ca gories according to the Smith (1950) system of typology. Smith's typology was chosen becau its use of the criteria of surface treatment, paste, decorative technique, and rim and vessel form allows the typologist to classify all non-eroded sherds within its system. However, as Salwen (1968:325), Byers and Rouse (1960:14), and even Smith (1950:189) himself point out, t is one problem with this system. The undecorated body sherds and decorated sherds from a single vessel may be placed within separate pottery types. For this reason, we decided tha only sherd categories containing rim sherds could justifiably be assigned to types.

2 of our 7 categories meet this requirement. But since they include only one rim she each (and therefore only 1 vessel) and bear little resemblance to any previously published t they may be idiosyncracies rather than the product of a "mental template". Consequently, t categories can only be classified as "sherd groups", in which the members of each group al share a combination of ceramic attributes distinct from those of other groups. These "she group" categories should in no way be regarded as pottery "types".

The number of sherds within each group and their stratigraphic position within the sit are summarized in Fig. 3. Each category is briefly described below:

Undecorated Sherds

Smoothed exterior/cord-marked interior (30 sherds).

This is a very crumbly, sandy-granular ware tempered with medium to coarse quart and sodium feldspar grit 1 to 5 mm. in size. (The size of the temper particles has been cla ed as follows: fine—below 1 mm. in length; medium—1 to 3 mm. in length; coarse—over 3 mm length.) It is quite thick; the sherds range from 9-12 mm. in thickness, the majority being 10 mm. thick. They have a hardness of 2.1-3.0 on the Mohs Scale. Exterior surfaces are smoothed. Interior surfaces are covered with either cord-wrapped paddle or cord-wrappe stick impressions, some of which have been partially smoothed over. Exteriors range in c from buff to orange, with a few gray mottles; interiors and sherd cores exhibit some orang coloring, but they are mostly gray. Coil breaks are present.

With two exceptions, the sherds in this category were recovered from the eastern en the excavated area. 19 sherds were associated with the shell stratum, while 11 sherds wer found 1 to 2 in. into the orange sand. At least 2 vessels are represented. The interior sur of 1 vessel (28 sherds) bears cord-wrapped paddle impressions; several of these impressio have been partially smoothed over. The interior surface of the second vessel (2 sherds) be cord-wrapped stick impressions and wiped marks, as though it had been smoothed with blad grass prior to its being impressed. The paste and surface treatment of both these vessels characteristic of the earliest Windsor pottery; no other Northeastern pottery types bear co marked impressions on their interior surfaces, and so it is most probable that they are the sherds of either Modified Vinette Interior (Salwen 1968:326) or Matinecock Point Stamped s (Smith 1950:196).

Cord-marked exterior/eroded interior (4 sherds).

The paste of these sherds is granular and tempered with a few medium coarse partic

FIGURE 3
Distribution of Specimens

	Humus	Shell	Orange	Total
1. Post-Contact Material				
Ceramic	94	13		107
Glass	573	4		577
Metal	53			53
Coal	72	5		77
Miscellaneous	18			18
Total Post-Contact	810	22		832
2. Aboriginal Material				
Ceramic				
Smoothed ext./cord-marked int.		19	11	3
Cord-marked ext./eroded int.		4		4
Smoothed ext. and int./ grit temp.		10	2	1
Smoothed ext. and int./shell temp.		3		3
Decorated		4		
Total ceramics		40	13	5
Chipped stone				
Projectile points				
Rossville/Adena		2		
Levanna		2		
Wading River		4		
Normanskill		1		
Brewerton		1	1	
Unclassified		1		
Unidentifiable point frag.		6	2	
Knives and preforms	2	4	6	
Scrapers				
Endscrapers	1		1	
Flake sidescrapers	4	3	2	
Flake endscrapers		6	2	
Gouges	1	3		
Gravers		2	2	
Drills		2		
Denticulate		1		
Cores	1	5	1	
Unutilized flakes	44	361	146	55
Ground stone				
Manos	1	2	2	
Hammerstones		6	5	1
Paintstones		2		
Adze		1		
Abrader		1		
Total stone	54	416	170	64
Worked bone		2		
Cut shell segments		9	7	
Total bone and shell		11	7	
Total Aboriginal	54	467	190	7

Continu

FIGURE 3 Cont'd.
Distribution of Specimens

	Humus	Shell	Orange
3. Faunal Remains			
Bone			
Mammal long bone frag.	1	20	5
Beaver humerus		1	
Small mammal rib	1		
Deer vertebra		1	
Muskrat canine		1	
Shell			
Busycon	1	12	1
Total Faunal Remains	3	35	6
Total Specimens	867	524	196

of quartz grit (ca. 3 mm. in length). The sherds range in thickness from 5.5-6.5 mm., but have eroded surfaces, which indicates that they were originally at least 1-2 mm. thicker th they are now. Exterior surfaces are covered with cord-wrapped paddle impressions; interi surfaces are eroded. Exteriors are buff-colored, while both the interiors and sherd core gray.

The sherds probably represent a single vessel, as they were all found in the shell str at the eastern edge of the excavation.

Smoothed exterior/smoothed interior grit-tempered (12 sherds, including 1 rim sher

The paste of these sherds has a somewhat sandy-granular texture and is tempered w medium to coarse quartzite and sodium feldspar grit. Both exterior and interior surfaces smoothed; the exterior of one sherd exhibits wiped marks. Exteriors range in color from and light brown to orange. Interiors and sherd cores range from buff and light brown to gr Coil breaks are present.

All but one of the sherds in this category were recovered from the eastern and east- portion of the excavation. 10 were from the shell stratum while 2 were found in the first 3 of orange sand. At least 2 vessels are represented. Two conjoined body sherds and the sin rim sherd from our collection indicate that one was a straight-walled vessel with a flatten outsloping lip but no neck (Fig. 4). It had a rim thickness of 6 mm., a body thickness of 8- and was tempered with dark gray shale. The interiors of the body sherds exhibit very faint markings which may be smoothed over cord marks, but the evidence is inconclusive. Unfo nately, this vessel fits none of the available descriptions of smoothed-surface undecorated pottery from this region, typed or untyped (i.e., Ritchie and MacNeish 1949:103, 110; Byers Rouse 1960:19; Keener 1965:25; Salwen 1968:328-29). Because the vessel has no similar co parts, either within the literature or at Kaeser itself, it may be anomalous and we have ref from classifying the category as a new type.

Smoothed exterior/smoothed interior shell-tempered (3 sherds).

This pottery has a somewhat soapy texture, probably because it is tempered with a fe medium-sized (1-2 mm.) particles of crushed shell. Both exterior and interior surfaces ar smoothed. They range in color from buff to gray; sherd cores are gray.

One vessel is represented. It was located in the shell stratum at the easternmost edg the excavated area.

Decorated Sherds

Stab and drag fabric-marked/smoothed interior grit-tempered (one rim sherd, Fig. 4

This sherd has a granular texture, as it is tempered with medium-coarse quartzite a sodium feldspar grit. The exterior surface is fabric-marked, while the interior surface is smoothed. Both surfaces are buff with dark gray mottling; the sherd core is brown and gra

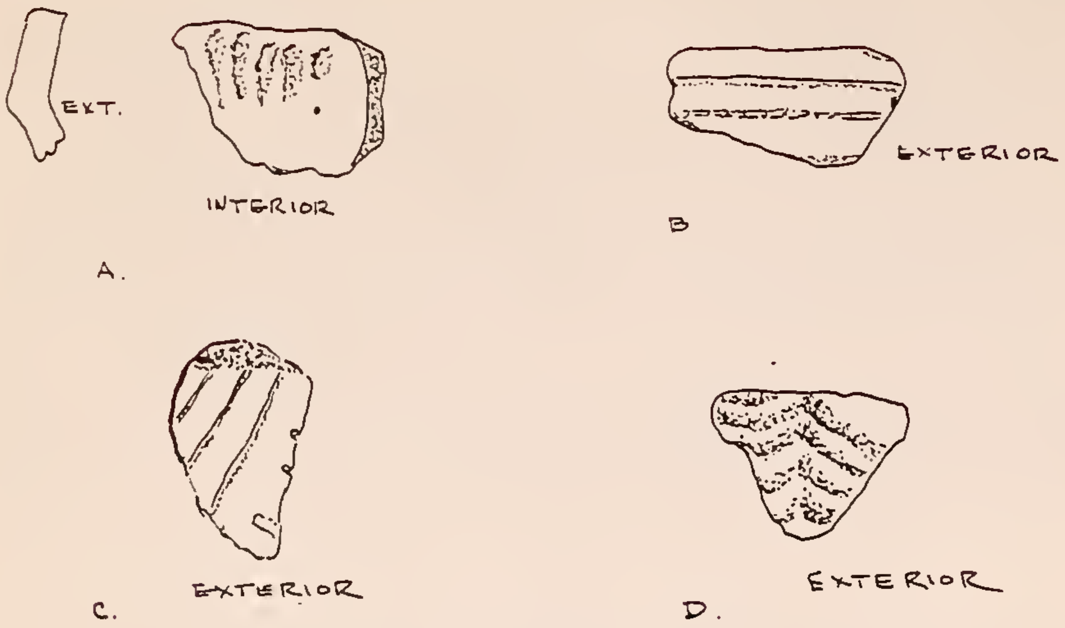

FIGURE 4.

The sherd represents a small vessel with a mouth diameter of 3 in. The vessel had a flattened lip and sharply constricted neck. Both the top of the lip and interior rim are encircl by a single row of stab and drag incision. It was found in the shell stratum within the central portion of the excavation.

The vessel does not fit any of the known pottery types, nor does it match any of the untyped sherd descriptions found in the literature. Consequently, it may have been the product of an idiosyncratic rather than a cultural technique, and so we do not feel justified in presenti it as a new taxonomic category.

Cord-wrapped stick smoothed interior grit-tempered (1 sherd Fig. 4b).

This sherd has a granular paste tempered with medium-fine quartz grit. Exterior surfa finish is unknown, but beneath the decoration it is smoothed. The interior surface is also smoothed. Both surfaces and the sherd core range in color from light brown to dark gray. Coiling is indicated. Decoration consists of 2 horizontal rows of cord-wrapped stick impressi

The sherd was found at the easternmost edge of the excavation at the top of the shell, somewhere between 0-1 in. into the stratum. The sherd's superior position within the same square as a siltstone Wading River point (found near the base of the midden, 3-1/2 in. into the shell) suggests chronological placement. Wyatt (1976), however, notes that the use of such points continues from Late Archaic through at least Early Woodland times.

Incised smoothed interior grit-tempered (2 sherds).

Due to its grit tempering, the paste of both sherds has a granular texture. The type of exterior surface treatment is unknown, although it is smoothed under the decoration. Interior surfaces are smoothed. Exteriors range in color from orange to buff and light brown. The interior surface of sherd #1 is buff with dark gray mottling; the interior of sherd #2 is orange. The sherd cores range from light brown to gray. Coil breaks are present.

2 vessels are represented. Vessel 1 (sherd #1) is tempered with fine-sized quartz grit. Its exterior surface exhibits wide (2.5-3.0 mm.) but shallow parallel incisions. These appear to be framed on one side by shallow elongate punctates, possibly outlining a triangle motif (se Fig. 4d). Vessel 2 (sherd #2) is tempered with medium-coarse dark gray shale (Fig. 4c). On

its exterior are 3 parallel rows of horizontal incisions, below (or above) which is a line of parallel diagonal incisions. The incisions are narrower and deeper than those of vessel 1; measure less than 1 mm. wide. Both vessels were found on top of the shell stratum. Vess was excavated from the central portion of the site, Vessel 2 from the eastern end.

Because they are represented only by body sherds, these vessels cannot be assigned t specific type. But, since the combination of incising and smoothed interiors is attributed to East River Aspect in this area, it seems fairly safe to assume that they are a Late Windso (and therefore most probably a Late Woodland ware). That they post-date the Early Woodl is indicated by the stratigraphic position of sherd #2. It was found in the same square as 2 Early Woodland lobate-base points, but the latter were located at the base of several inche shell while the former was recovered from the very top of the midden. One point was loca only 19 in. north of the sherd.

The color attributes of the sherds provide us with some clues to the coastal Woodland method of pottery manufacture. The buff and orange exteriors and gray interiors indicate t the vessels were fired upside down in an oxidizing atmosphere, such as an open fire. Yet t presence of a few randomly occurring gray mottles on the exterior surfaces suggests that t pots were covered with brush during the firing, which created a reducing atmosphere near some parts of the vessels.

III. Lithic Artifacts

640 stone artifacts were recovered from the Kaeser site. 551 (86%) are non-utilized s and 7 (1.1%) are cores; only 87 (13.6%) can be classified as tools. After careful examinat under a binocular microscope (7 x 30 magnification), these artifacts were classified into n tional categories according to their differential wear patterns (Semenov 1970; Winters 196 1976 - personal communication).

In the case of biface fragments, however, not all could be classified in functional cat es on the basis of wear. It occurred to us that since knives and points perform different func they might be distinguished by the size of their edge angles. We hypothesized that, becaus are used for piercing and not cutting, points should have smaller distal and lateral angles knives. Fisher Exact tests (Siegel 1956) were performed on angle ranges of the site's *kno* (i.e., already categorized by wear patterning) (1) quartz knives and points, (2) jasper-cher knives and points, and (3) knives and points regardless of lithic composition. (See Append contingency matrices.) A probability value of .05 was chosen as significant for rejection o null hypothesis. We considered any phi value of .5 or greater as indicative of strong assoc tion. The following tests were significant, and so their null hypotheses were rejected; no t on lateral angles were significant:

1. H_0: There is no difference in the distal angles of quartz points and knives.
   H_1: Quartz knives have greater distal angles.
   The test was significant beyond the .05 level (one-tailed), and has the highest degree predictive power (1.00).
2. H_0: There is no difference in the distal angles of points and knives.
   H_1: Knives have greater distal angles.
   The test was significant beyond the .02 level (one-tailed); it has a high degree of pre e power (.83).

All other tests involving the above paired artifact categories and angle ranges were nificant. But in the test concerning the angles at the point or distal of jasper-chert project points and knives, this was apparently due to the very small sample size, as the associatic the highest degree of predictive power (1.00). The clear dichotomy of point tip angle rang presented by the contingency matrix of the latter test (Appendix A, 2) strongly suggests th there is a significant difference in the angles of jasper-chert knives and points as well as of quartz points and knives and points and knives in general. In the comparison of jasper-c t points and knives, the points have point tip angles between 19° and 25°, as opposed to the

36°-37° angle of the chert knife. In the comparison of the point tip angles of quartz points an knives, all of the knives had angles between 41-50° while all of the projectile points had angle between 26-39°. The comparison of the angles of the total number of knives and points sugge that the two functional tool types can be distinguished by the size of their point tip angles rega less of their respective lithic compositions. The point tip angles of all the knives fall betwee 36-50°, while those of all but one of the points fall between 19°-35°; the atypical point had a distal angle of 39°.

We also hypothesized that the mid-section of the knife blades would be thicker than thos of points, since the former tools are used for cutting and so more pressure is applied to this area. The greater the pressure, the thicker the area must be to withstand it. All of the kniv had a maximum thickness between 9.25 and 17.0 mm. All but two of the points had a maximu thickness of 4.74-9.0 mm.; the atypical points (both composed of quartz) have a maximum thickness of 10.25 and 10.50 mm. A Fisher Exact test was performed on the relevant variabl it was significant beyond the .05 level (one-tailed) and the association has a high degree of predictive power (Ø = .78).

Because a point-knife dichotomy in both the size of the distal angle and the thickness o the mid-section seems quite apparent in our collection, the remaining biface fragments were classified into functional categories based upon these measurements. We realize, of course, that the classification, based as it is upon such small sample sizes, must be considered tent

The number of artifacts within each functional category and their stratigraphic positio within the size are summarized in Fig. 3. They are briefly described below:

a. General utility tools

This category includes tool types that may have been used in a number of activities bu present methods of evaluating wear patterns do not permit us to differentiate between these various functions.

Hammerstones. 11 natural pebble hammerstones were recovered from excavation at Kaeser; most were made of sandstone, and some of quartzite. 6 of these were found in the s midden and 5 in the orange layer below. Of these found in the shell, 2 were from the wester portion of the site and 6 from the east; in the orange sand, 3 hammerstones were found in th western half of the site and 2 in the east. The majority of these were used fairly lightly, an only at one end; only 2 were used at both ends.

b. Cutting Tools

Backed knife. A backed knife is one in which the edge opposite the cutting edge has be left unthinned and is frequently blunted by crushing, which provides an effective gripping su for its use as a hand tool (Winters 1969:35). A single quartz example was recovered from t west end of the excavation. Because it is only the tip, the knife's form and complete dimens are unknown. It has a maximum thickness of 10.50 mm. In cross-section, it is convex-irre The point tip angle measures 49°-50°; the lateral angle ranges from 60-70°.

Triangular knife (Fig. 7b). 1 dark green and white chert specimen was recovered fro the west end of the excavation The sides and base of the knife are convex. It has a maxim thickness of 6.30-9.30 mm. Its cross-section appears plano-slightly convex. The point tip angle is 36-37°, while the lateral angle is 38-40°. A large flake has been removed on both s of the base, indicating thinning for hafting purposes. The knife has only one working edge; exhibits use polish as well as wear marks, strongly suggesting that the knife was used for cu fairly soft materials, and not in woodworking activities.

"Blank" knife. A single example of an artifact blank used as a knife was recovered fr Kaeser. It was of gray chalcedony. Microanalysis suggests possible crushing at one edge. providing a gripping surface. It has a maximum thickness of 17.0 mm. The point tip angle i 49°-50°, and the lateral angle is 60-70°. In cross-section the knife is plano-convex. Its pr venience is unknown.

Flake knives. Flake knives are those formed from free flakes, one (or more) sides c which is used as a cutting edge. 4 specimens were recovered from Kaeser, 3 of brown or g chert and 1 of white chert with gold speckles. The wear marks on 2 of the chert knives ind te a cutting and twisting motion. One of these knives had been heat-treated. The gray and bro chert knives were all excavated from the west end of the excavation, while the gold speckle chert knife came from the east-central area. The (working) edge angles on the knives rang between 20-28°.

Unclassifiable knife fragments. 6 knife fragments were recovered: 1 dark gray cher se and 5 white quartz blade fragments. The chert base (Fig. 7a) was the only knife excavated m the east end of the excavation. 1 quartz fragment was excavated from the east-central are d 1 was excavated from the west-central area, while the remaining 3 fragments were found i he west end.

c. Weapons and Hunting Implements

Levanna points (Figure 6b,e). 1 complete triangular point and 1 base were recovere th of the same dark gray chert. The point was found at the junction of humus and shell in the t-central portion of the excavation; the base was excavated from the shell at the west end. T sides of the point are slightly incurvate, while those of the basal fragment are straight. B have concave bases and exhibit retouch along base and sides. Due to a heavy medial ridge running the entire length of the point blade, its maximum thickness is 9.0 mm. The ridge creates a triangular cross-section. The point has a tip angle of 19.5°, and a lateral angle 40-45°. The basal fragment has a maximum basal thickness of 4.75 mm. The blade is len lar in cross-section. There is no medial ridge. Its lateral angle ranges from 30-40°. The f l and dimensional attributes of these two specimens fit the Late Woodland Levanna point typ (Ritchie 1971:31).

Rossville/Adena points (Figure 5c;6f). 2 stemmed lobate-base points were found w several inches of each other at the very base of the shell midden in the eastern portion of excavation. One is an exotic tan-gold jasper, while the second is of white quartz. Both p have fairly narrow symmetrical isosceles triangular blades. Blade edges are excurvate shoulders are weakly angled. The junction of blade and stem forms an obtuse angle. The s of the stem converge to form a convex base. The points have a maximum thickness of 6.5 10.25 mm. The tan point is much more finely flaked than the quartz point. Its shallow fl scars and relatively greater control over flake placement indicate indirect percussion, pr y the baton technique. The point is plano-convex in cross-section. Its quartz counterpart i ticular. The quartz point also exhibits lateral grinding along its stem.

The formal and dimensional attributes of these points fit both the New York Adena type as described by Ritchie (1971:12,61) and the shouldered, lobate-base variety of the R lle type illustrated by Kinsey (1972: Figs. 53A, 120B). In any case, both types have been ass to the Early and early Middle Woodland periods.

Wading River points (Fig. 5b,f;6c). 4 crudely-chipped stemmed points were recove from the shell layer at the eastern edge of the excavation. 3 are of quartz and one of silt e. All 4 belong to the Northeastern Narrow Point Tradition, a late Archaic manifestation tha appears to have continued into early ceramic times or later in the coastal area (Ritchie 1 143-44; Fowler 1971:5; Swigart 1973:43-44; Wyatt 1976). They have triangular blades and l- lel-sided stems. The junction of blade with stem forms an obtuse angle. The single silts point has an asymmetrical blade with slightly excurvate edges. Both shoulders are round Blade tip and base are missing. It is plano-convex in cross-section. The quartz points h lenticular cross-sections. 2 of the quartz points are approximately equilateral triangles asymmetrical blades. In each one shoulder is rounded, the other sharply angled. The poi also share straight blade edges and straight bases, one of which exhibits basal thinning o h its sides. The remaining quartz point has a slightly asymmetrical blade in the form of a isosceles triangle. Although angled, neither of its shoulders are really sharply defined. base still has the cortex attached, which forms a convex bevelled edge. The points range

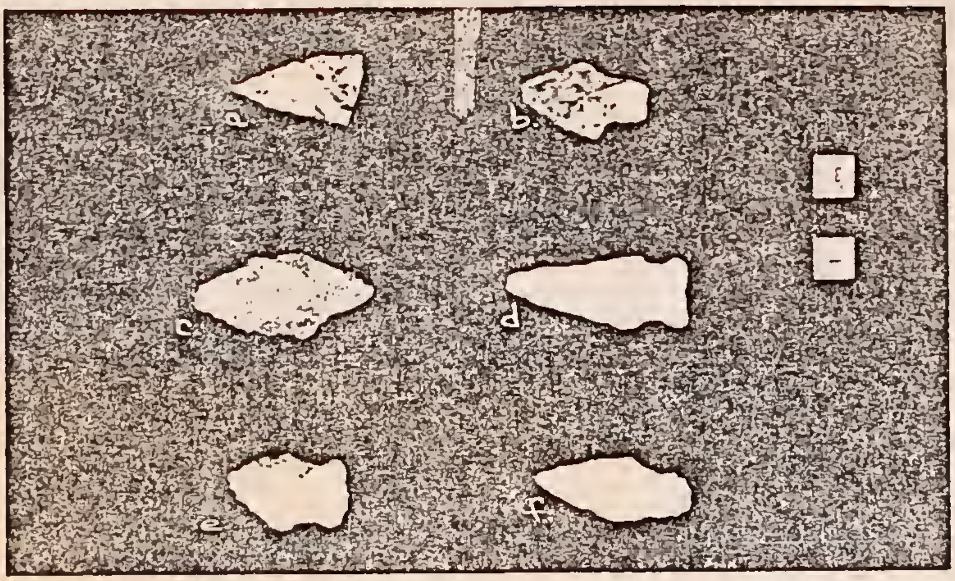

FIGURE 5. Quartz projectile points and knives. a. knife tip; b. Wading River point; c. Rossv point; d. Normanskill point; e. possible Brewerton side-notched point; f. Wading River point.

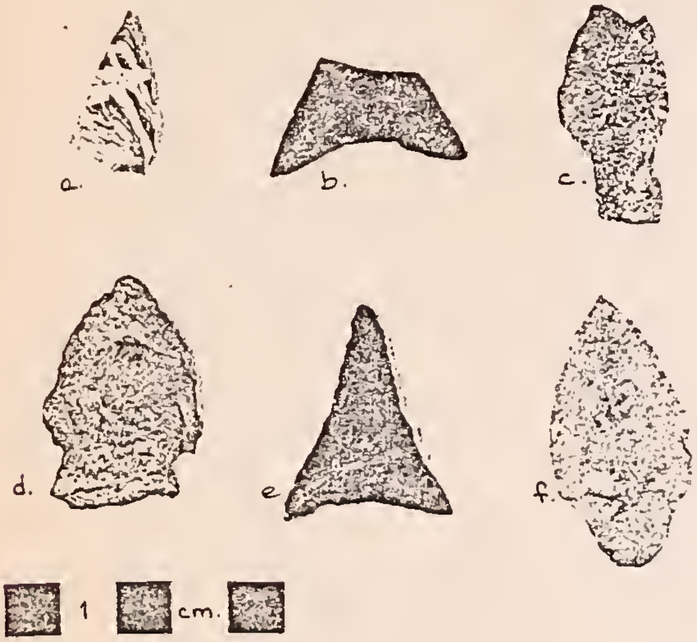

FIGURE 6. Chert and siltstone points and knives. a. chert knife tip; b. Levanna base, chert, c. Wading River point, siltstone; d. unidentified corner-notched point, chert; e. Levanna point, chert; f. Rossville point, chert.

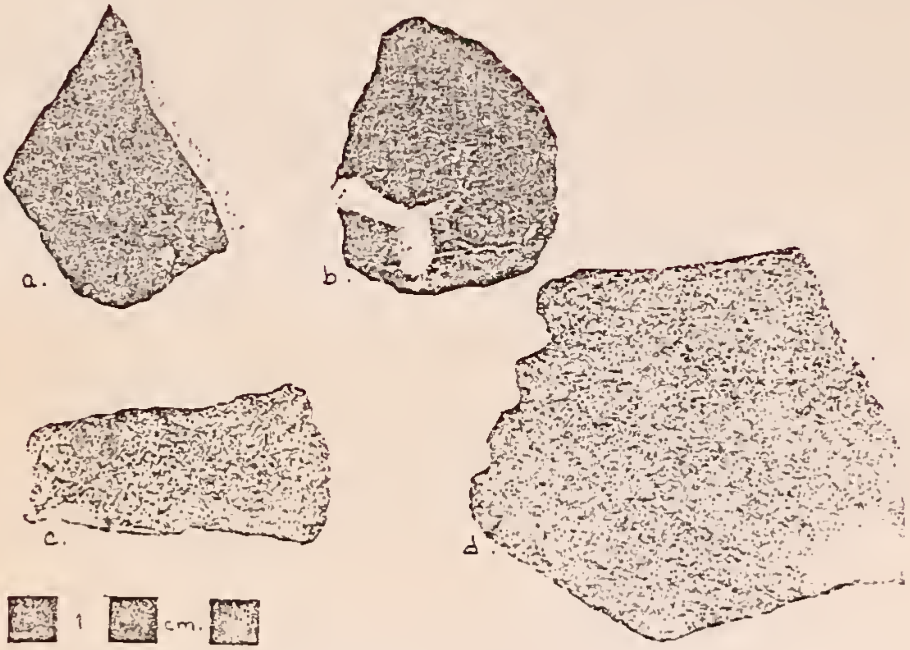

FIGURE 7. Cutting and other tools. a. knife base, chert; b. triangular knife, chert; c. un ed object, siltstone; d. stemmed denticulate, siltstone.

maximum thickness from 5.75-8.75 mm. Lateral angles range from 31-65°. Point angle e from 34-39°. The formal and dimensional attributes of these points fit the Wading River type as described by Ritchie (1971:131-32).

Normanskill point (Figure 5d). A single quartz side-notched point belonging to the N y Point Tradition was recovered from the shell layer in the eastern end of the excavation. found at the same level as, but 21 in. away, from one Wading River point, and 1.5 in 18 in. away from a second Wading River point. The blade is in the form of an isosceles t e; its edges are straight. The base is very slightly concave, and has been slightly thinned o sides. In cross-section the point is convex-triangular in shape. Its maximum thickness 10.50 mm. The lateral angle is 60-65°. The formal and dimensional attributes of this po well the Normanskill point type described by Ritchie (1971:37).

Possible Brewerton Eared-Triangle point. The base of a quartz triangular point was recovered from the shell layer in the east-central area of the excavation. The side of its is slightly excurvate. A flake had been removed from its lower side, producing an eared The base had been thinned on one side and appears to be slightly concave. Neither it nor t appears to have been ground. The fragment is 6.50 mm. thick. Its lateral angle ranges fr 35-45. In cross-section it is plano-convex. Since the other end of the base was not recove and it is impossible to discover whether the flake producing the eared effect was purposel struck off by its maker or accidently struck off during use, we very tentatively classify th nt as a Brewerton Eared-Triangle (Ritchie 1971:18).

Possible Brewerton Side-Notched point (Fig. 5e). A single quartz side-notched poin recovered from 1-1.5 in. of orange sand at the west end of the excavation. Its blade is an lateral triangle. One edge is straight while the other is slightly excurvate. The side notc are broad and shallow, forming thick basal ears. The notched edges exhibit grinding. The of the point is slightly convex and has been thinned on both sides. In cross-section the poi triangular-convex. The point is quite thick, measuring 10.25 mm. Its formal and dimens attributes most closely fit the Brewerton Side-notched point type (Ritchie 1971:19-20, 72).

Unidentifiable Corner-notched point (Figure 6d). A rudely-chipped shaley gray chert poin was recovered from the shell at the eastern end of the excavation. The somewhat asymmetrical blade is in the form of an equilateral triangle; its edges are excurvate. They have been corner-notched, but because the barbs have been broken off, it is not known to what extent.

The expanding base has been thinned on one side. It has been broken in several places. making it impossible to discern whether it had a straight or concave edge. There is no basal grinding. The point is plano-convex in cross-section. It has a maximum thickness of 5.50 mm. The tip angle is 21°; the lateral angle ranges from 22-29°. Because the barb ends and parts of the base have been broken off, we were unable to type this specimen.

Unclassifiable point fragments. 6 point tips, 3 blade fragments, and 1 preform fragment were recovered. 3 of the tip fragments were composed of brown or gray chert, 1 of quartz, 1 of argillite, and 1 of white and red mottled chert (apparently fire-reddened (Fig. 6a). The che tips were excavated from the humus-shell junction in the east-central section of the site, the shell layer at the east end, and the first 3 in. or orange sand at the west end. The quartz tip wa excavated from the shell layer at the east end. The argillite tip was recovered from the shell a the west end of the excavation. 2 of the 3 blade fragments were composed of quartz; 1 was of u known provenience and the other was found in the first 3 in. of orange sand at the west end of th excavation. The third blade fragment, which was composed of the gold speckled chert, was foun in the shell stratum in the east-central section of the excavation. The single stemmed preform fragment was composed of dark gray chert and excavated from the east end of the shell layer.

d. Hideworking Tools

Flake denticulate and sidescrapers (Figure 8e). A flake-scraper is an irregular flake whose side (sides) bears the characteristic wear pattern of a scraping tool. A flake denticulate has the same characteristics plus small points or "teeth" along the working edge. 9 flake sidescrapers were recovered from Kaeser: 4 were composed of dark gray chert, 1 of light gray chert, 1 of brown chert, 1 of coarse siltstone, 1 of argillite, and 1 of jasper. The light gray ch specimen is a multiple-function tool; one of its sides was used as a sidescraper while the other side bears the wear marks and teeth of a denticulate. Both it and the jasper scraper had been heat-treated (turning the originally yellow jasper to red). 2 of the dark gray chert scrapers, the argillite scraper, and the siltstone scraper were found in humus directly above the shell a the east end of the excavation. The jasper sidescraper was found in the shell layer of the san square. The heat-treated chert scraper was found in the shell layer in the east-central portio of the site, while the remaining brown and gray chert scrapers were located in the shell and first three inches of orange strata at its western edge.

Flake endscrapers (Figure 8a, c). Like the flake sidescrapers, these are irregular flak whose end (or ends) have been used for scraping. 8 such scrapers were recovered. Except fo 1 of quartz, all were manufactured from chert. The quartz scraper was excavated from the fi 3 in. of orange sand at the west end of the excavation. The 2 dark gray chert endscrapers wer found in the shell layer at the western end of the excavation. The 2 brown chert scrapers wer also recovered from this area, 1 from the shell and 1 from the 3 in. of orange sand. The red and white speckled scraper (manufactured from heat-treated gold and white chert) was excava from the shell in the central portion of the excavated area. The remaining light gray heat-trea scrapers were excavated from the shell layer in the eastern and east-central regions of the excavation.

e. Wood-working Tools

Endscrapers

Pebble endscraper. A single dark gray and white mottled chert pebble with 1 edge utiliz as a scraping tool was recovered from the humus at the east end of the excavation. The pebble scraper retains its cortex. Its working edge has an angle of 65-70°. Such a steep working ed along with the absence of use polish, strongly suggests a wood-working function (Winters 1975, personal communication).

Miscellaneous endscraper. A plano-convex artifact was recovered from the first 3 in. orange sand at the east end of the excavation. Microscopic analysis indicates its possible u an endscraper. The artifact, manufactured from a heavy quartz flake and still retaining its has an edge angle of 70-75°. Like the pebble endscraper described above, the steep workin edge suggests a wood-working function.

Gouges (chipped stone).

Stemmed gouge. A single quartz specimen was recovered from the shell layer at the eastern edge of the excavation.

Unstemmed gouge (Figure 8b). A single dark gray chert plano-convex gouge was rec from the shell layer in the eastern end of the excavation. Its proximal dorsal half still ret the cortex. One of its sides appears to have been blunted by crushing, probably for use as hand tool. (The crushing would allow pressure to be applied without cutting the palm of the

Miscellaneous gouges. 2 gouges with broken proximal ends were also recovered. 1. slightly concave-convex yellow jasper specimen, was found in the humus layer in the west- area of the excavation. Like the unstemmed gouge described above, its sides have been bl by crushing. The other gouge, a plano-convex quartz specimen, was located in the shell la at the east end of the excavation.

All of the artifacts described above display the steeply bevelled ventral edge charact istic of a gouge tool. The absence of smooth wear and heavy use polish argue against a hi working function. Instead, the battered and spalled edges strongly suggest woodworking.

Ground adz (Figure 8f). The bit half of a ground stone tool was recovered from the stratum at the western edge of the excavation. Its steeply bevelled dorsal edge, combined a plano- and heavily spalled ventral edge, identify it as an adz. It was manufactured from gray slate. On one side, several deep striations indicate that the adz was used to sharpen tip of another tool, perhaps a bone awl.

f. Perforating Tools

Drills.

Wing-based drill (Figure 8d). A single dark gray chert drill was recovered from th of the shell in the east end of the excavation. It has a concave expanding base. Heavy gri is evident along both the base and sides of the bit, which had been broken at the tip

Unclassifiable drill tip. One dark gray chert drill tip was recovered from the shell stratum in the eastern part of the excavation. The fragment exhibited use polish all along sides and distal end.

g. Gravers

The base of these artifacts is an unmodified free flake from which protrudes a poin triangular "beak". The distal end of this beak bears a wear pattern suggestive of a gra tool. 4 such tools were recovered. 1 quartz and 1 dark gray chert graver were found in first 3 in. of orange sand in the west and west-central portions of the excavation; a dark chert and a gray limestone graver were excavated from the shell layer in the east and ea central portions.

h. Knapping Artifacts

Cores. 7 irregularly-shaped cores were recovered; 5 were composed of quartz an chert. 4 of the quartz cores were found at the eastern end of the excavation, 3 in the shel and 1 in the humus. 1 quartz core and 1 gold and white speckled chert core were found in central part of the excavation in the orange and shell strata, respectively. A dark gray c core was found in the shell strata at the western edge of the excavation.

Non-utilized chips and flakes. 551 unmodified chips, from every stratigraphic leve flakes, were recovered. Out of this total 425 (77.1%) were chert, 92 (16.7%) were quartz, (3.1%) were jasper, 14 (2.5%) were silt-stone, and 3 (0.6%) were quartzite. The chert fra ranged in color from brown and various shades of gray to grays mottled with white, dark chert containing glass specks, and white chert with gold speckles. 5 of the gray chert, 2 gold speckled chert, and 8 of the jasper flakes had been heat-treated (turning the gold in the latter 2 materials a bright red).

The ratio of jasper-chert debitage to jasper-chert tools is 10.8:1. The ratio of quartz debitage to quartz tools is even smaller—4.4:1, which suggests that knapping was only a minor activity at the site (Wilmsen 1968:984).

i. Domestic Equipment

These artifacts are those used in the processing of food. The pottery described in section II is, of course, included.

Manos. We have adopted Winters' (1969) criteria for the identification of manos, namely "1) battered ends or edges; 2) uniform breaking or erosion of the patina over the entirety of flat or slightly convex surface; 3) erosion of the edges of minute, natural pits on the same surfaces, so that the edges become square rather than rounded as they are in the natural state; 4) occasionally striations developed in the mano surface from abrasion against a metate or other lower grinding element." (1969:61).

5 manos were found, 1 in the humus layer, and 2 each from the shell and orange levels. 4 were from the eastern end of the site and 1 from the west. 2 were made of rough sandstone. 2 of a finer-grained sandstone, and 1 of igneous rock. 3 of the 5 are rectangular in shape; the amount of use varies considerably among the manos.

j. Miscellaneous Artifacts

Paintstones. 2 paintstones were recovered. 1, a graphite fragment with artificial striations, was recovered from the shell layer at the eastern end of the excavated area. Its striae are 0.50-0.60 mm. wide, and even more shallow; they were probably formed by an abrader as to scratch off the powder for use as paint.

The second paintstone is a triangular-shaped fragment of limonite recovered from the shell layer at the western end of the excavation. Both surfaces and enas exhibit signs of use; they were apparently ground against a hard surface in order to produce a reddish powder.

Stemmed denticulate (Figure 7d). A heavy, crudely-chipped coarse siltstone denticulate was recovered from the shell layer in the east end of the excavation. It has 4 rounded teeth.

Possible Core sidescraper. This quartz artifact was recovered from the humus level in the west-central portion of the excavation. Microscopic analysis suggests possible use as a sidescraper.

Unclassifiable worked stone. A pinkish beige chert fragment was recovered from the humus layer in the west-central area of the excavation. It had a broken proximal end and an ovoid distal end. A gray quartz flake was found in the first 3 in. of orange sand at the west end of the excavation, and a coarse gray siltstone object (Fig. 7c) was excavated from the shell layer at the eastern end. Although all 3 artifacts were worked along 1 or more of their edges, we were unable to place them into any of our general functional categories.

Abrader. One possible abrader was found in the shell midden at the eastern end of the site. It was smooth and ungrooved and made of very fine grained sandstone.

Summary

In summary, 9 functional artifact categories (and 1 miscellaneous category) are represented at Kaeser: general utility tools, cutting tools, weapons and hunting implements, hide-working tools, woodworking tools, gravers, perforating tools, knapping artifacts, and domestic equipment (i.e., the manos and the pottery described in Section II). Brown and gray cherts and white quartz are the major lithic materials utilized by the Kaeser occupants. Of the total 640 artifacts, 460 (71.9%) are chert, 119 (18.6%) are quartz, 20 (3.1%) are jasper, and 41 (6.4%) are manufactured from miscellaneous materials.

IV. Bone and Shell Artifacts

Only 2 pieces of worked bone were recovered during excavation. Both were too fragmentary to be able to discern tool type or species of animal bone. Both showed a light use polish and could have come from a type of awl. Both were found in the shell at the eastern end of the

13 squares of hard clam shell (*Venus mercenaria*) showing evidence of cutting were f during excavation; it is probable that these are rejects from one of the early stages of bead manufacture. 8 were found at the eastern end of the site and 5 at the western end; all but or were in the shell layer (the exception is from the top of the orange layer). These artifacts included in the category of bead-making equipment in the analysis below.

V. Faunal Material

Bone

30 pieces of unworked bone were recovered from excavation. Most were too fragmen to identify. The majority (18 pieces) were of unidentifiable mammal long bone. 23 pieces were recovered from the shell level, perhaps because of better bone preservation due to al linity (see below). 5 pieces (17%) were from the orange layer, and 2 larger, more recent, sections were found in the humus layer (these and some fish remains were thought to be th remains of contemporary fishing and picknicking activities in the park). Of the bone segme found in the shell layer, 15 (including a porcupine canine) were from the eastern half of th while 8 (including a deer vertebra) were from the west. Of those in the orange sand, 3 we from the east and 2 from the west. The 2 pieces in the humus were from the western half the site. In addition to the mammal long bone pieces, there was 1 section of small mamm from the humus layer in the western part of the site, 1 segment of deer vertebra (*Odocoil virginianus*), 1 porcupine (*Erethizon dorsatum*) canine, and 1 probable beaver humerus (*Ca canadensis*) in the shell at the eastern end of the site.

Shell

In addition to the shell midden analysis reported below, we found 2 large pieces and columellae of *Busycon carica* (?), 9 of which came from the eastern end of the site and 7 f the west. These show no evidence of having been cut; apparently the conch was used for and not for bead manufacture. We also recovered 1 *Janthina globosa* shell (from the hum level at the eastern end of the site), and 1 *Eupleura caudata* from the shell layer in the w portion. Neither shell was cut and neither represents a known major food source.

Midden Analysis

Column samples measuring 6 by 6 in. were taken from each of the 9 squares excav 1973. They were taken in natural stratigraphic levels and were analyzed according to th described by Meighan (1958). Since the shell midden represents the remains of a major base for the prehistoric inhabitants of the Kaeser site, we were interested in several asp the composition of the midden, as manifest in the column samples.

1) What molluscs were represented?
2) In what proportion were they each represented?
3) How did the composition of the midden vary over the site?
4) How does the composition of the Kaeser midden compare with that of other mid the area?
5) If the midden composition varies, does it vary in a manner which confirms the h (In other words, does its variation relate to the dimension of horizontal location within t midden, and does it correlate with the distribution of time-sensitive artifacts, as describ the analysis below?)
6) If the midden composition varies, does it vary in a manner which suggests the d tial use of shellfish resources over time (or space)?

The results of the midden analysis are summarized in Fig. 9.

The most interesting aspects of this table relate to the distribution of hard shell c oyster through the midden. As is clear from inspection, this distribution varies widely square to square. A 2-tailed chi square test on the amounts of clam and oyster in each is significant at less than .001, which validates the impression received on inspection. chi square one-sample tests on the amount of clam in each square and the amount of oys each square are both significant at less than .01, demonstrating that neither of these re is distributed evenly over the site.

The ratio of clam to oyster is also quite variable; clam ranges from 1-1/2 times common to 13 times as common as oyster. This variability is not significant when test t-test. When the mean and standard deviation is expressed as a percent of the mean, this fig is .90 for clam and 1.26 for oyster. While these figures will not differ from each other significantly (using the Coefficient of Dispersion described by Thomas, 1975) they lend support to Salwen's (1970) statement that the use of a boat to collect oysters may account for the greate variation in that mollusc's distribution.

VI. pH Tests

The acidity of the soil of different levels was examined by means of a pH test done on t column samples using a Beckman pH meter. The results are described in Fig. 10. T-tests done to compare the mean pH for humus, shell and orange sand layers show significantly different (two-tailed tests with an alpha level of .05) acidity levels for humus vs. shell and humus vs. orange stratum. The shell midden has the most alkaline soil, as is expectable. T orange sand has a pH which is fairly close to that of the shell, which may be explained by the visual evidence of the shell midden leaching down into the orange. If we had separated the t 3 in. of the orange sand from the rest of the level, the results might have been quite differen

FIGURE 9
Shell Midden Composition

Sample	Vol.	Wt.	Composition							Shellfish	
	cc.	gms.		Shell						Meat sq.	
			Rock	Clam		Oyster		Unident.		Clam (x/4.23)	Oyst. (x/5)
			wt.	wt.	%	wt.	%	wt.	%	gms.	gms.
0W2N*	690	800	177.0	40.2	5.03	4.5	.56	<.5	<.06	950.4	90.0
5W0N	840	1000	106.1	81.7	8.17	13.2	1.32	3.8	.38	1931.4	264.0
10W0N	795	1000	114.4	353.3	35.33	66.8	6.68	13.3	1.33	8352.0	1336.0
15W0N	860	1000	103.2	231.0	23.10	149.0	14.90	17.6	1.76	5460.9	2980.0
30W25	920	1000	85.9	33.3	3.33	2.9	.29	.9	.09	787.2	58.0
53W2N*	800	1000	45.4	426.5	42.65	79.5	7.95	28.0	2.80	10082.7	1590.0
53W10N*	940	1000	85.3	98.5	9.85	9.0	.90	10.2	1.02	2328.6	180.0
65W0N	790	1000	155.15	34.6	3.46	5.0	.50	6.1	.61	451.5	72.0
70W0N	845	1000	-	77.1	7.71	5.9	.59	3.3	.33	1822.7	118.0

FIGURE 10
PH. Tests

Humus		Shell		Yellow-Orange	
Sample No.	PH.	Sample No.	PH.	Sample No.	PH.
9	6.7	1	7.1	3	6.6
10	5.8	4	5.9	5	6.9
12	4.9	6	7.1	17	6.7
13	5.4	8	6.4	23	5.9
14	6.1	11	6.5	28	6.6
18	5.3	15	6.5	29	6.1
19	6.1	16	6.4	30	6.5
25	5.7	22	7.1	31	6.1
		27	6.7	32	6.3
Mean	5.75		6.63		6.41
S.D.	.56		.41		.33

Discussion

The preceding ceramic and lithic analyses demonstrate that Kaeser is a multi-compon site that was probably occupied by Early or early Middle Woodland, Late Woodland and Middl or Late Archaic, aboriginal groups. 30 (56.6%) of the 53 sherds recovered from the site are from vessels diagnostic of the early Windsor North Beach focus, which has been placed with the Early or early Middle Woodland (Ritchie 1969:xxx-xxxi; Kaeser 1974:20). Similar pottery can be seen at the Morris Estate Club site (Kaeser 1963), Pelham Boulder (Lopez 1956), and t Schurz Site (Lopez 1955), all of which are located in the Bronx. 5 of the 11 identifiable proje points belong to the Narrow Point Tradition, which in southern New York and New England ex from Late Archaic into early ceramic times (Ritchie 1969:143-44; Swigart 1973:43-44; Fowle 1974:5). In point of fact, their spatial and stratigraphic positions within the site indicate that the points were coeval with the North Beach ware. 3 of the points were found in the same 5- square as were all but 3 of the early Windsor sherds; the points were found well into the shel while the sherds were found in both the shell and first 1-2 in. of orange sand. Both were adj to Feature One, which suggests that the feature may date to this period, too

Of the remaining identifiable points, 2 of them closely resemble the Adena and Rossvill lobate-base points, both of which have been identified as Early to early Middle Woodland typ (Ritchie 1971:12, 61; Kinsey 1972:192, Figures 53A, 120B). 2 other points fit most closely th Brewerton Eared-Triangle and Brewerton Side-notched types, which suggests a probable Mid or Late Archaic occupation of the site. The last 2 identifiable points represent the Levanna point type, a Late Woodland manifestation, as are the 2 Incised/Smoothed sherds. At another site in Pelham Bay Park, Milo Rock, a point which looks like a Levanna point was excavated (Lopez 1956:130).

In our analysis of the ceramic and lithic materials, we noticed that the early Windsor pottery and Narrow-stemmed points were concentrated at the eastern end of the excavation, the Incised/Smoothed sherds and Levanna points were recovered from its west and central p tions (the western 50 ft.). A Fisher Exact test was performed to test the possibility that the spatial associations may be due to chance alone. A probability level of .05 was chosen as si nificant for rejection of the null hypothesis. The association was significant beyond the .0 level (one-tailed test), and has predictive power (Ø = .63). Consequently, the null hypothesis is rejected and we may infer that the spatial distributions of the Early (or early Middle) Woo land and Late Woodland occupations were nonrandomly localized at the east end and central-portions of the excavation, respectively.

We noticed that the two Archaic points also appeared to be localized in the west and ce part of the excavation. A Fisher Exact test was performed to test the possibility that, like th Late Woodland artifacts, they were also spatially differentiated from the Early Woodland materials. The test was significant beyond the .001 level (one-tailed test), and it has very hi predictive value (Ø = .97). Consequently, the null hypothesis is rejected and we may infer th the Early Woodland and Archaic occupations at Kaeser were nonrandomly localized in the eastern and west-central areas of the excavation, respectively.

The stratigraphic location of its diagnostic artifacts clearly demonstrate that the Earl Woodland component was associated with the shell midden. 26 (70.1%) such artifacts were recovered from the shell, while the remaining 11 (29.7%) were recovered from the first 1-2 of orange sand. Because the latter was heavily mottled with brown stains containing shell fr ments in this area, it seems safe to assume that this was the base of the midden, and artifac excavated from it were probably associated with the midden occupation.

As for the Late Woodland occupation, 1 Levanna point was found well within the shell midden. But the two incised sherds were found on *top* of the shell midden immediately below the humus; the remaining Levanna point was also recovered from the junction of the humus a shell zones. Interestingly enough, the 3 artifacts recovered from the top of the shell were located in the central portion of the excavation at the periphery of the Early Woodland occup while the Levanna point found within the midden was located at its western end. A Fisher Ex test was performed to test the possibility that the stratigraphic associations may be due to ch

A probability level of .05 was again chosen as significant for rejection of the null hypothesis. The test was significant beyond the .0005 level (one-tailed test), and has a high degree of prec tive power (Ø = .85).

Consequently, we may reject the null hypothesis and infer that the Late Woodland occu tion was associated with the west and central portions of the midden. The western shell see to be the exclusive remains of a Late Woodland shellfish-collecting party, while the central shell—composed of lower and upper sections—represents a combination of Early and Late W land collecting activities, respectively.

But the association of a Middle to Late Archaic occupation with the shell midden is far from clear. Firstly, the occupation is represented by only 2 points, whose classification is n without some doubt (See Section III). Secondly, the Brewerton side-notched point was found b the midden, in 1.5 in. of orange sand. Lastly, although the Brewerton Eared-Triangle was labelled as coming from the shell layer, in that particular square the midden is less than 1 in thick and there is virtually no shell at all in the portion from which the point came. So there a good chance that the points may actually have been associated with the orange sand zone.

Because the two major occupations at Kaeser were spatially differentiated, we hypothesized that the distribution of the various artifact categories might correlate with their spatia dichotomy. Chi square (Siegel 1956) or Fisher Exact tests were performed (1) on pairs of artifact categories and (2) on the east and central-west spatial dichotomy of the two Woodla occupations. The former test was used if the number of artifacts involved was sufficiently large. The following tests were significant, and so their null hypotheses are rejected:

(1) H_0: There is no difference in the spatial distribution of domestic equipment and cutting t
H_1: There is a difference in the spatial distribution of domestic equipment and cutting to

A Chi square test was significant beyond the .000005 level (two-tailed test), and the as tion has predictive value (Ø = .62).

(2) H_0: There is no difference in the spatial distribution of cutting and woodworking tools.
H_1: There is a difference in the spatial distribution of cutting and woodworking tools.

The Fisher Exact test was significant beyond the .01 level (two-tailed test); the assoc has a fairly high degree of predictive power (Ø = .69).

(3) H_0: There is no difference in the spatial distribution of cutting and beadworking (drills. clam squares) equipment.
H_1: There is a difference in the spatial distribution of cutting and beadworking equipme

The Fisher Exact test was significant beyond the .01 level (two-tailed test); the associ has predictive strength (Ø = .59).

(4) H_0: There is no difference in the spatial distribution of domestic equipment and hidewo tools.
H_1: There is a difference in the spatial distribution of domestic equipment and hidework tools.

A Chi square test was significant at better than the .01 level (two-tailed test); the ass tion has predictive power (Ø = .47).

(5) H_0: There is no difference in the spatial distribution of hideworking and woodworking to
H_1: Preceding tests have demonstrated that (a) both hideworking and cutting tools are s differentiated from domestic equipment, the latter being concentrated at the east e the excavation and the former in the west and central areas, and that (b) the cutting are also spatially differentiated from the woodworking tools in like manner. Consec ly, it is logical to hypothesize that the hideworking and woodworking tools will demonst similar differentiation. The hideworking tools should be concentrated in the central west region of the excavation, while the woodworking tools should be concentrated a eastern end.

The Fisher Exact test was significant beyond the .05 level (one-tailed test); the assoc has predictive power (Ø = .43).

All other tests involving paired artifact categories and spatial locations were insigni Tests involving paired categories and vertical distribution (i.e., strata) were also insignific indicating that all of the categories were associated with the midden and top of the orange s

(The lower humus, which also contained artifacts, appears to be associated with the upper
midden.) The combined test results—both significant and insignificant—suggest that food p
cessing, woodworking, and beadworking activities were carried out at the eastern end of th
excavation, whereas cutting and hideworking activities were carried out in the western and
central portions. In fact, a Chi square test performed on these two sets of functional categ
and the east and central-and-west spatial dichotomy was significant beyond the .01 level (tw
tailed test); although the association has limited predictive power (Ø = .39). The spatial co -
tion of the hideworking tools and the knives suggests that the knives functioned in the initi t
of the hideworking process as tools for skinning and dismembering the kill.

Because the spatial dichotomy of functional categories coincides with the spatial dic y
of Early and Late Woodland artifacts, we very tentatively suggest that the food processing i-
working, and beadworking activities were associated with the Early Woodland occupation o
site, and the hideworking activities with its Late Woodland occupation.

A Chi square test was also performed on the possibility that the spatial distributions
chert and quartz artifacts, the two major lithic materials at the site, might concur with th
the two Woodland occupations. The test was significant beyond the .01 level (two-tailed tes
but the index of predictive power was low (Ø = .15). The results suggest that chert and qu
were the major materials for both the Early and Late Woodland chipped stone technologie
Kaeser, but that chert was utilized to a greater extent than quartz by the Late Woodland oc -
tion, while the opposite was true for the Early Woodland.

The distribution of clam and oyster were examined in reference to the division of th
into eastern and central-western halves. While the distribution of clam and oyster varies
the site as a whole, when each is examined by means of t-tests comparing the mean amou
clam (or oyster) in each half, there are no significant differences in the site. Therefore,
cannot correlate a differential use of resources with different chronological periods. The
no evidence that the resource base changed over time in a significant way.

The several functional artifact categories represented at the site indicate that Kaes
not just an overnight camp site, but that its occupants had spent some time there. Yet the
number of artifacts and the absence of postmolds and many other functional categories su
sewing, weaving, ceremonial, recreational, and domestic equipment (aside from manos an
pottery) such as metates, nutstones, and pits, indicate that the stay was not a lengthy one.
absence at Kaeser of postmolds, and therefore of any definable house structures, also su
a fair-weather occupation. For the Late Woodland occupation, at least, hideworking activ
suggest an early fall occupation, as the poor condition of animal skins in spring and summ
discourage hideworking activities during that time of year.

These characteristics (limited number of tools and functional categories, absence e
structures) are exhibited by other northeastern shell midden sites.

Two other sites in Pelham Bay Park, the Archery Range site (Kaeser 1962), and P
Boulder (Lopez 1956) show a similar pattern. Few tools are found, the majority of artifa
recovered being pot sherds.

At Archery Range 1120 sherds and 29 stone tools (almost all projectile points and h er-
stones) were recovered. Quantitative data are lacking at Pelham Boulder. At Muskeeta
(Salwen 1968) in Glen Cove, Long Island, about 11 pots and 241 stone artifacts were reco
201 of which were nonutilized chips. Only 5 functional categories were represented: gene
utility cutting and chopping tools, weapons, perforating and woodworking tools, domestic -
ment (pottery), and a miscellaneous category containing paintstones. At Oakland Lake in ide,
Long Island (Kaeser 1974), the double component shell midden contained 106 stone and b
artifacts and 880 pot sherds. 30 artifacts and 85 sherds belong to an Early Woodland occ on,
while 76 artifacts and 795 sherds represent a Middle Woodland occupation. Only 5 functi
categories were represented: general utility chopping and scraping tools, weapons, perfo g
tools, fishing equipment, domestic equipment (pottery), and a miscellaneous category con ng
hematite paintstones. At Croton Point, a midden excavated by Brennan, located on the H
River in Westchester County, excavations recovered only 15 artifacts—a single point tip,
hammerstones, and general utility cutting and scraping tools (Salwen 1970:34). Although

molds were present at one of the sites (Muskeeta Cove), they were randomly placed and did nc form any structural outlines; they may simply have been poles for holding and smoking shell (Salwen 1968:324).

The composition of the Kaeser midden was compared with that of Croton Point (Salwen 1 and Muskeeta Cove 2 (Salwen 1968). All three sites varied in the presence of particular speci of shellfish. At Croton Point, oyster made up more than 99% of the shell (Salwen 1970:2), whil at Muskeeta Cove, soft shell clam was the dominant mollusc (66%), with 12% hard shell clam a 20% oyster (Salwen 1970:3). The sites were similar to each other in one aspect of the midden composition—each had one dominant species. At Kaeser, the overall composition of the midd was 76.6% hard shell clam, 18.7% oyster and 4.6% unidentified. Also, Kaeser and Muskeeta C had approximately the same amount of oyster and clam, although there was no softshell clam Kaeser.

Salwen (1965) notes that molluscs are important indicators of coastal environment. Wit hard shell clam as the dominant species, salt water-covered mud flats is the most likely loca environment.

The distribution of shell over the site was compared for Kaeser and Muskeeta Cove 2. both sites, the mean amount and standard deviation of each species was calculated. When the standard deviation was expressed as a percent of the mean, for Muskeeta Cove the figures ar 45.5% for soft-shell clam, 44.7% for hard shelled clam and 151.1% for oyster. For Kaeser, th figures are 90% for hard shelled clam and 126% for oyster. While the unevenness of distribu is much greater at Muskeeta Cove, the same tendency is present, namely for clam to be mor evenly dispersed through the midden while the presence of oyster is more erratic.

Two other sites in the Bronx had middens which resembled Kaeser in the types of moll present. Both Milo Rock (Lopez 1958) and the Morris Estate Club site (Kaeser 1963) have middens composed of oyster and hard shell clam in total or in almost total dominance, altho quantitative data on proportion are not provided.

In addition, midden analyses from the samples of Muskeeta Cove and Croton Point (Sal 1970:2-3) concur with those from Kaeser; i.e., that virtually all of the meat from the midde be attributed to shellfish. Early seventeenth century ethnohistories (Mourt 1963:65; Wood 1865:39, 107) describe similar encampments at which small groups of coastal Algonkians wo congregate for several days or weeks during the spring and summer to collect and dry fish a shellfish, which they later carried back to their main camp.

These data support Salwen's (1970:4) hypothesis that the Northeastern shell middens represent temporarily-occupied special purpose sites for the collection and processing of sh fish. As such, they were only one of several types in the subsistence-settlement system of t Northeast coastal groups from at least Early Woodland times until European contact.

Conclusions

Kaeser has been used to demonstrate statistically significant differences in the distrib tion of both time-sensitive and functionally distinct artifact categories.

We have shown that in the case of Kaeser the midden was apparently accumulated by th occupation of different areas of the site at different time periods, rather than a uniform occu tion which might result in a more typical layer-cake stratigraphy. Another possible model fo midden accumulation is suggested by Brennan in a recent paper; he believes that artifacts fo in shell middens are not contemporary with the shell in those middens but are from a later period when the shell has partially decomposed. Whichever of these interpretations is corre several cautionary notes must be appended. First, we recognize that we have no clear pictu of small-scale variations in activity patterns. We cannot say what the reuse of the site from year to year is like, but we can suggest that the Archaic and Early to early Middle Woodlanc peoples used a different area of the site than later groups. Second, we cannot assume that midden is formed this way that all other shell middens have been similarly formed. The co mation of this hypothesis from these data will, we hope, lead to its re-evaluation by other archeologists who excavate shell midden sites.

Acknowledgements

Fieldwork at the Kaeser site was carried out with the permission and cooperation of t
New York City Parks Department. The field crew was composed largely of anthropology ma
from New York University and neighboring colleges. The authors wish to thank Bonnie Bur
and Richard Charmatz of the New York University Geology Department for lithic identificati
of the artifactual materials. Laura Smith of Bennington did the midden analyses. We also
to thank Robert Bettinger of the New York University Department of Anthropology for his ad
on statistical procedures and comments on an earlier draft of this article. Special thanks g
to Howard D. Winters, also of the NYU Department of Anthropology, for his help in function
analysis of the artifacts.

APPENDIX A

Fisher Exact Tests

1. Distal angles of quartz points and knives.

	distal angles 25-40°	 41-50°	
points	5	0	5
knives	0	3	3
	5	3	8

$p = .018$
(1-tailed)

$\phi = 1.00$

2. Distal angles of chert and jasper points and knives.

	distal angles 19-25°	 36-37°	
points	3	0	3
knives	0	1	1
	3	1	4

$p = .25$
(1-tailed)

$\phi = 1.00$

3. Distal angles of all points and knives.

	distal angles 19-35°	 36-50°	
points	6	1	7
knives	0	4	4
	6	5	11

$p = .015$
(1-tailed)

$\phi = .83$

4. Maximum thickness of points and knives.

	max. thickness		
	.475-.90	.925-1.70 cm.	
knives	0	5	5
points	11	2	13
	11	7	18

$p = .04$ (1-tailed) $\phi = .78$

5. Spatial distribution of Early and Late Woodland artifacts

	East	Central-West	
E. Wdld.	35	2	37
L. Wdld.	1	3	4
	36	5	41

$p = .007$ (2-tailed) $\phi = .63$

6. Spatial distribution of Early Woodland and Archaic artifacts.

	East	Central-West	
E. Wdld.	31	2	33
Arch.	0	2	2
	31	4	35

$p = < .002$ (2-tailed) $\phi = .97$

7. Chi Square
Spatial distribution of domestic equipment and cutting tools.

	East	Central-West	
Domestic	47	11	58
Cutting	1	12	13
	48	23	71

$p = < .001$ (2-tailed) $\phi = .61$

8. Spatial distribution of cutting and woodworking tools.

	East	Central-West	
Cutting	1	12	12
Woodwk.	6	2	8
	7	14	21

$p = < .01$
(2-tailed)

$\phi = .69$

9. Spatial distribution of cutting and beadworking equipment.

	East	Central-West	
Cutting	1	12	13
Beadwk.	9	5	14
	10	17	27

$p = < 0.006$
(2-tailed)

$\phi = .59$

10. Spatial distribution of hideworking and food-processing artifacts.

	East	Central-West	
Hidewk.	5	12	17
Food pr.	47	11	58
	52	23	75

$p = < .002$
(2-tailed)

$\phi = .47$

11. Spatial distribution of hideworking and woodworking artifacts.

	East	Central-West	
Hidewk.	5	12	17
Woodwk.	6	2	8
	11	14	25

$p = .10$
(2-tailed)

$\phi = .42$

Winters, Howard D.
1969 *The Riverton Culture. Illinois Archaeological Survey*, Monograph 1, .. es State Museum, Reports of Investigations 13.

Wood, William
1865 *New England's Prospect.* Prince Society Publications No. 1.

Wyatt, Ronald J.
1976 The Archaic on Long Island. Paper presented at New York Academy ces conference on *Amerinds and their Paleoenvironment in Northeastern America.*

12. Chi Square

Food processing, woodworking and beadworking vs. hideworking and cutting tools.

	East	Central-West	
FP, WW, BW	62	18	80
HW, Cutting	5	12	17
	67	30	97

p = < .001 (2-tailed)   Ø = .39

13. Chi Square

Chert and quartz distribution

	East	Central-West	
Chert	163	282	445
Quartz	61	51	112
	224	333	557

p = < .002 (2-tailed)   Ø = .15

Bibliography

Brennan, Louis

n.d. The Midden is the Message; an Investigation into the Age Relationship of O Shell Middens along the Lower Hudson River and the Cultural Materials Fo on and in them. Unpublished ms.

Byers, Douglas S. and Irving Rouse

1960 A re-examination of the Guida Farm. *The Bulletin*, Archeological Society Connecticut 30:5-39.

Fowler, William S.

1974 A study of projectile points. *The Bulletin*, Massachusetts Archaeological 35:1-7.

Griffin, James B., Richard E. Flanders and Paul F. Titterington

1970 The burial complexes of the Knight and Norton mounds in Illinois and Mich *Memoir 2*, Museum of Anthropology, University of Michigan.

Kaeser, Edward J.

1962 The Archery Range Site: a preliminary report. *The Bulletin*, New York St Archeological Association 24:4-7.

1963 The Morris Estate Club site. *The Bulletin*, New York State Archeological Association 27:13-21.

1974 The Oakland Lake Site (Har - 14 - 4). *The Bulletin*, New York State Arche al Association 60:1-27.

Lopez, Julius

1955 Preliminary report on the Schurz site (Throgs Neck, Bronx County, N.Y.). *Bulletin*, Nassau Archeological Society 1:6-21.

1956 The Pelham Boulder site, Bronx County, N.Y. *Bulletin*, Eastern States Arc gical Federation 15:15.

Keener, Roger L.
1957 Some notes on interior cord-marked pottery from coastal New York. *Pen vania Archaeologist* 27:23-28
1958 Curvilinear design elements in the New York coastal area. *The Bulletin*, Archeological Society of Connecticut 28:3-11.
1958 The Milo Rock site, Pelham Bay Park, Bronx County, N.Y. *Pennsylvania Archaeologist* 28:127-142.
1965 The Phillips Site Excavation. *The Bulletin*, Archeological Society of Conn at 33:13-44.

Kinsey, W. Fred (Ed.)
1972 Archaeology in the Upper Delaware Valley. The *Pennsylvania Historical a Museum Commission Anthropological Series* no. 2. Harrisburg.

Meighan, Clement W. *et. al.*
1958 Ecological interpretation in archaeology. *American Antiquity* 24 (1 & 2):1- 131-150.

Mourt, G.
1963 *A Journal of the Pilgrims at Plymouth - Mourt's Relation.* Edited by D. H Corinth Books, New York.

Neumann, Georg K. and Melvin L. Fowler
1952 Hopewellian sites in the lower Wabash Valley. In Hopewellian communitie in Illinois, edited by T. Deuel. Illinois State Museum *Scientific Papers* 5:1 8.

Ritchie, William A.
1969 *The Archaeology of New York State.* Second edition. Natural History Pr Garden City, N.Y.
1971. *A typology and nomenclature for New York projectile points.* *Bulletin* 38 New York State Museum and Science Service.

________ and Richard S. MacNeish
1949 The pre-Iroquoian pottery of New York State. *American Antiquity* 15:97-

Salwen, Bert
1965 *Sea levels and the Archaic Archaeology of the Northeast coast of the U States.* PhD. dissertation, Columbia University.
1968 Muskeeta Cove 2; a stratified Woodland site on Long Island. *American A* 33:322-40.
1970 Cultural inferences from faunal remains: examples from three Northeast al sites. *Pennsylvania Archaeologist* 40:1-8.

________ and John Vetter
1974 Techniques for delineation of activity areas in a shell midden site. Prese at 39th Annual Meeting, Society for American Archaeology. Washington,

Semenov, S. A.
1970 *Prehistoric technology.* Adams and Dart. Bath, England.

Siegel, Sidney
1956 *Nonparametric statistics for the behavioral sciences.* McGraw-Hill Book New York.

Smith, Carlyle S.
1950 *The archaeology of coastal New York.* Anthropological Papers, American Museum of Natural History 43 (part 1).

Swigart, Edmund K.
1973 The Kirby Brook (5-LF-2): an interim report. *The Bulletin*, Archeologic Society of Connecticut 38:40-76.

Thomas, David H.
1975 Nonsite sampling in archaeology: up the creek without a site? In *Sampli Archaeology*, Edited by W. Mueller. University of Arizona Press, Tucson.

Wilmsen, Edwin N.
1968 Lithic analysis in paleoanthropology. *Science* 161:982-87.